

Description of three new species of *Trophon s. l.* Montfort, 1810 (Gastropoda: Muricidae) from Chile

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ABSTRACT. Three new muricids species of *Trophon s.l.* Montfort, 1810 are described. No related fossil or Recent species have been found to compare with *T. condei* n.sp., *T. ceciliae* n. sp. is compared with *Pagodula mucrone* (Houart, 1991) from southeastern Brazil and *Trophon bahamondei* McLean & Andrade V, 1982 from Chile, *T. vangoethemi* n.sp. is compared with *Boreotrophon avalonensis* Dall, 1902 from southern California, USA. The genus *Boreotrophon* Fischer, 1884, some Antarctic and South African species as well as additional and comparative material are discussed.

INTRODUCTION

The current study is based on material obtained from deep water dredging operations off Chile and submitted for study by G. T. Poppe (Berchem). The shells were taken alive but no soft parts were preserved.

The deep water molluscan fauna off the coast of Chile has not been studied thoroughly; however, studies based on expeditions and commercial trawling for shrimp that included muricids have been published by Dell (1971), McLean & Andrade V (1982) and Pastorino (1999). *Trophon bahamondei* McLean & Andrade V, 1982 was described from Central Chile (25°0' S, 70°40' W) living at 950 m depth. Its range extends from Peru (3°25' S) to Algarrobo, Chile (33°22'S) from 240-1200 m. *T. veronicae* Pastorino, 1999 was described from off southern Chile (46°00' S, 83°59' W) in 742 m and extends its range to Argentina and to subAntarctic seas. *T. veronicae* is not closely related to any of the new species described here. Frassinetti (2000) described four new species from the Upper Pliocene of Guafo Island, southern Chile, which are also different from the new species described herein.

Remarks about the genus *Boreotrophon* Fischer, 1884

Boreotrophon species are usually considered as occurring only in the northern hemisphere while other "trophinines", for example species included in *Pagodula* or *Trophonopsis*, occur without distinction in the southern and in the northern hemisphere (Bouchet & Warén, 1985, Houart, 1998, 2001b). However, *Trophon barnardi* Houart, 1987 (Figs. 18-19) from South Africa, *T. coulmanensis* E.A. Smith,

1907 (Fig. 20), *T. declinans* Watson, 1882 (Fig. 21), *T. minutus* Melvill & Standen, 1907 (Fig. 22), *T. emilyae* Pastorino, 2002 and *T. arnaudi* Pastorino, 2002, all from the Antarctic, are probably other examples of southern *Boreotrophon* species. They all have a similar morphology (shell, operculum and radula) to the Northern Pacific and Atlantic species (Figs. 16-17, 28-30), Oliver & Picken (1984: fig. 36), Pastorino (2002a: Figs. 7, 12, 13, 24-27).

The species described herein also have typical shell and operculum characters of Northern Pacific and Northern Atlantic species of *Boreotrophon* (Bouchet & Warén, 1985; Egorov, 1992 and 1993; Houart, 2001a) and to my knowledge there is no other existing competitive genus for them. The operculum of all the new species is more or less ovate with a nucleus in lower left (Figs. 23-24). In *Boreotrophon clathratus* (Linnaeus, 1767), type species of *Boreotrophon*, the nucleus is situated in lower center and the operculum is more rounded abaperturally (Figs. 29-30). These same features appear in *B. cepula* (Sowerby, 1880), a species closely related to *B. clathratus*, and in Antarctic species (Pastorino, 2002a). However, a similar operculum to that of *T. condei* n.sp. can be observed in some forms of *B. alaskanus* Dall, 1902 from Northern Pacific, and also in *Nipponotrophon echinus* (Dall, 1918) from Japan (Houart & Lan, 2001: 39, fig. 5).

In *Trophon s.s.*, the operculum is broadly ovate with a lateral nucleus in lower right and the radula is ocenebrine (Figs. 25-26). It has been showed that *Trophon s.s.* is closely allied to *Ocenebra* and *Nucella* (Fig. 27) (Ocenebrinae) in anatomy, radula, protoconch, shell ultrastructure and operculum, and that it is perhaps more closely related to these two taxa than to other species hitherto included in Trophoninae (Kool, 1993a & b, Pastorino, 2002b).

However, awaiting additional studies others than shell, operculum and radula morphology, I will temporarily classify the new species described herein in *Trophon* s.l.

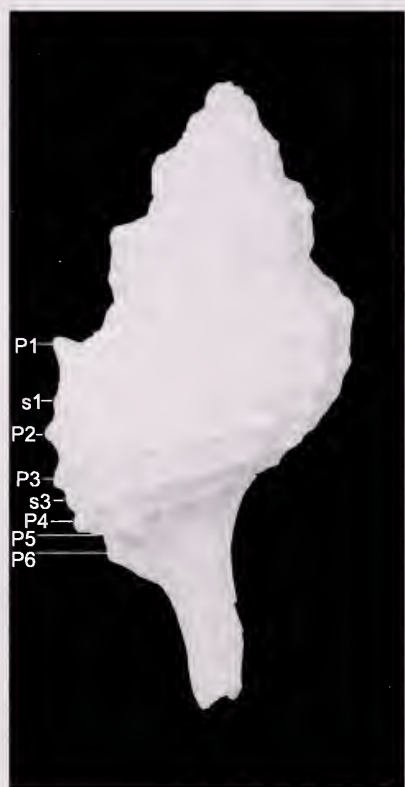
Abbreviations

BM(NH): The Natural History Museum, London, U.K.

IRSNB: Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium.

MNHN: Muséum national d'Histoire naturelle, Paris, France.

NMW: National Museum of Wales, Cardiff, U.K.



text conventions (from Merle, 1999, 2001).

P1 : shoulder spiral cord.

P2-P6 : Primary spiral cords of the convex part of the teleoconch whorl.

s1-s3 : secondary spiral cords of the convex part of the teleoconch whorl.

t1-t2 (in *T. condei* n.sp.): tertiary spiral cords of the convex part of the teleoconch whorl.

Text Fig. A. Spiral sculpture of *Trophon ceciliae* n.sp.

SYSTEMATICS

Family **MURICIDAE** Rafinesque, 1815

Genus *Trophon* Montfort, 1810

Type species by original designation: *Murex magellanicus* Gmelin, 1791 (= *Buccinum geversianum* Pallas, 1774); Recent, Magellanic region.

Trophon condei n.sp.

Figs. 1-2, 23, 31

Type material. Holotype IRSNB IG 29715/512, 61.4 mm.

Type locality. Chile, Ancud, trawled in 1350 m, muddy bottom.

Distribution. Chile, Ancud, living at 1350 m.

Description. Shell large sized, 61.4 mm in length at maturity (holotype), lightly built, lamellate. Spire high with 6+ broad, convex teleoconch whorls. Suture impressed.

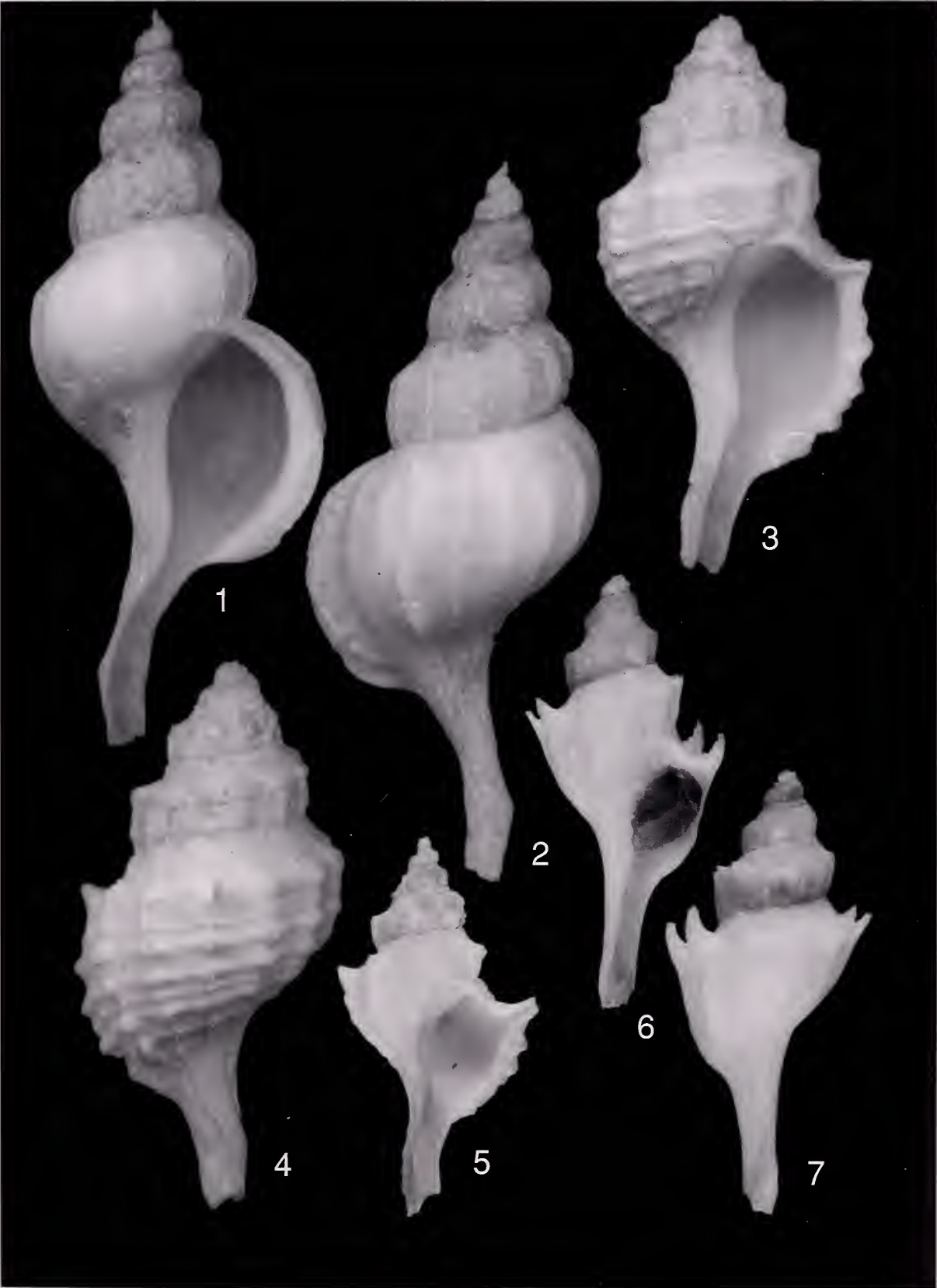
Protoconch and first teleoconch whorls unknown (eroded). Axial sculpture of early teleoconch whorls eroded. Other whorls with narrow, rounded ribs, only a few subsisting with bladelike lamellae on top. Last whorl with 14 axial ribs, penultimate 12, antepenultimate 9, previous 10. Other previous whorls with eroded ribs.

Figures 1-7

1-2. *Trophon condei* n. sp. Chile, Ancud, trawled in 1350 m, muddy bottom, 61.4 mm, holotype IRSNB 29715/512.

3-5. *Trophon ceciliae* n. sp.: **3-4.** Chile, Antofagasta, in 1000 m, muddy bottom, 41.5 mm, G. Poppe, holotype MNHN. **5.** Chile, Antofagasta, in 1300 m, muddy bottom, 16.5 mm, paratype coll. R. Houart.

6-7. *Trophon vangoethemi* n.sp. Chile, trawled off Itata, N. of Concepción, in about 350 m, muddy bottoms, 16.9 mm, holotype IRSNB 29715/513.



Spiral sculpture consisting of low, almost obsolete, smooth, primary, secondary and tertiary cords. Last whorl with P1, t1, s1, P2, t2, s2, P3, s3, P4, P5, P6; penultimate with visible P1, s1, P2, P3; antepenultimate with P1, s1, P2, P3.

Aperture large, broad, roundly-ovate. Columellar lip narrow, smooth, rim entirely adherent. Outer lip thin, expanded, erect, smooth. Siphonal canal long, narrow, abaxially recurved, broadly open.

Chalky white, aperture glossy white.

Operculum light brown, ovate, inverted tear-shaped with nucleus in lower left.

Remarks. No related fossil or Recent species have been found.

Etymology. Named after Javier Condé (Madrid, Spain), enthusiastic shell collector.

***Trophon ceciliae* n.sp.**

Text Fig. A, Figs. 3-5, 24, 31

Type material. Holotype MNHN, 41.5 mm, and one paratype coll. R. Houart, 16.5 mm.

Type locality. Chile, Antofagasta, 1000 m, muddy bottom.

Other locality. Chile, Antofagasta, 1300 m, muddy bottom (paratype R. Houart).

Distribution. Chile, Antofagasta, living at 1000-1300 m.

Description. Shell large sized for the genus, 41.5 mm in length at maturity (holotype), broad, biconical, weakly nodose. Spire high with 6+ broad, convex, nodose teleoconch whorls. Suture impressed. Protoconch unknown. Axial sculpture of teleoconch whorls consisting of high, strong, narrow, nodose ribs, topped by low, narrow lamellae, mostly eroded in holotype. Last whorl of holotype (probably seventh whorl) with 10 ribs, penultimate with 10, antepenultimate with 11. Axial sculpture of previous whorls eroded. Last whorl of paratype (probably fourth whorl), penultimate and antepenultimate with 8 ribs. First whorls eroded.

Spiral sculpture of low, strong, narrow, primary, secondary and tertiary cords. Ontogeny unknown. Last whorl of holotype with P1, s1, P2, P3, s3, P4,

P5, P6; penultimate whorl with visible P1, s1, P2, P3 (partially covered by last whorl); antepenultimate with P1, s1 (starting), P2. Last whorl of paratype with P1, P2, p3, s3, P4, P5, P6 (s1 not yet formed); penultimate whorl with visible P1, P2, P3; antepenultimate with P1, P2, P3. Previous whorls eroded. Crossing of axial ribs with primary and secondary spiral cords giving rise to small, low knobs, giving the shell a nodose appearance.

Aperture broad, ovate. Columellar lip narrow, smooth, rim completely adherent. Outer lip erect, smooth. Siphonal canal moderately short, weakly dorsally recurved, broadly open.

Chalky white, aperture glossy white.

Operculum light brown, ovate with nucleus in lower left.

Remarks. *Trophon ceciliae* differs from *Pagodula mucrone* (Houart, 1991) (Fig. 8), included in *Pagodula* Monterosato, 1884 by Houart (2001b: 265), in having a larger, broader shell with secondary spiral cords and more numerous primary cords. *P. mucrone* has no secondary cords and usually only P1 visible on early teleoconch whorls, and P1-P4 or P5 on last whorl. *T. ceciliae* differs from *Trophon bahamondei* McLean & Andrade V, 1982 (Fig. 9) in having more globose, broad, teleoconch whorls with distinct spiral sculpture, compared to the smooth shell of *T. bahamondei*. It also has a broader aperture, a broader shoulder, shorter carinal spinelets, and a comparatively narrower siphonal canal. No other related species have been found.

Etymology. This new species is named after Guido Poppe's wife, Cecile Hoskens.

***Trophon vangoethemi* n.sp.**

Figs. 6-7, 31, 32, 34

Type material. Holotype IRSNB IG 29715/513, 16.9 mm. Paratypes: 1 MNHN (14.7 mm), 2 R. Houart coll. (17.1 & 12.4 mm), 1 G.T. Poppe coll. (16.0 mm).

Type locality. Chile, trawled off Itata, North of Concepción, in about 350 m, muddy bottom.

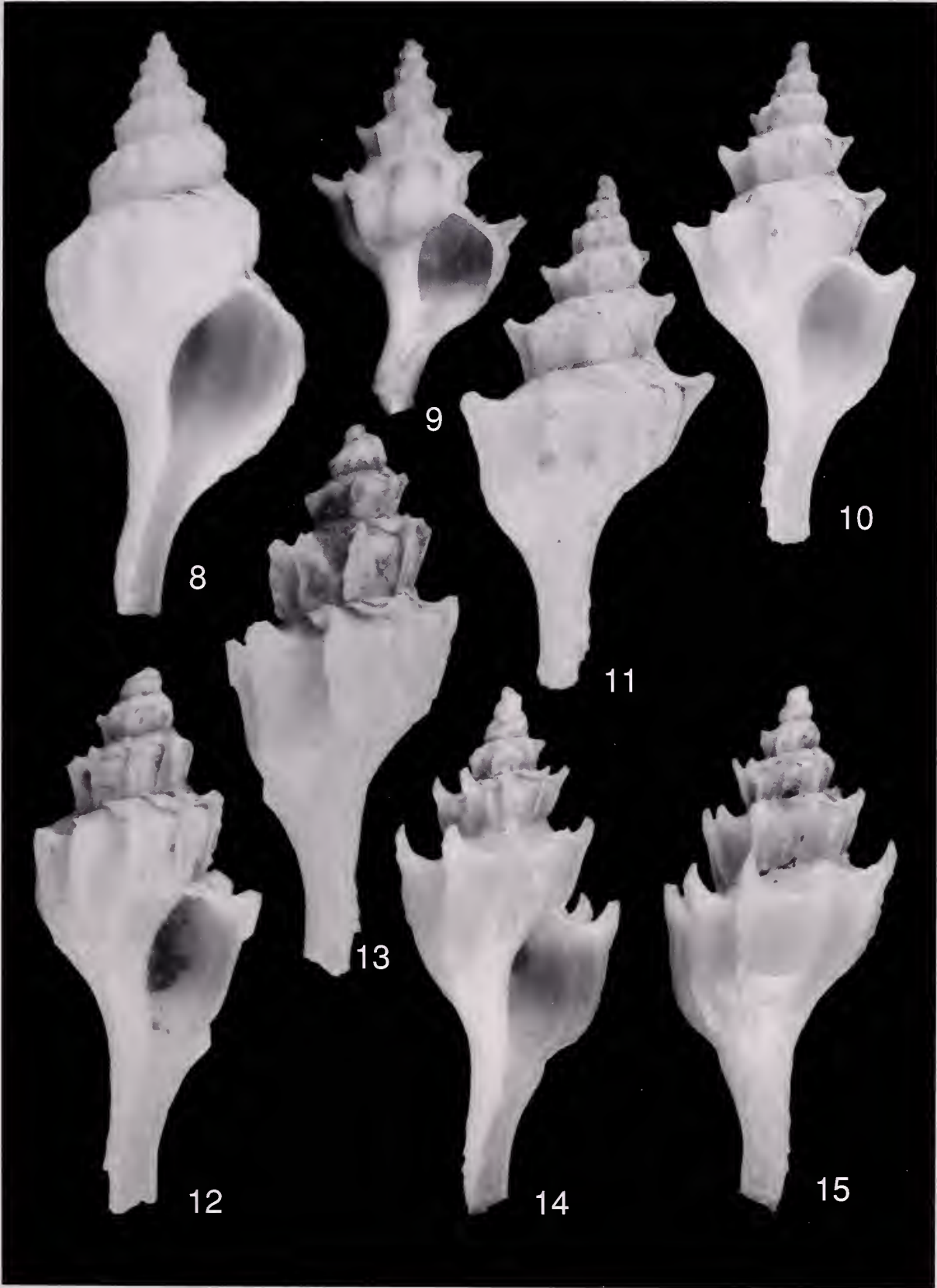
Distribution. Chile, off Itata, North of Concepción, living at 350 m.

Figures 8-15

8. *Pagodula mucrone* (Houart, 1991), Brazil, 19°02' S, 37°48' W, 1500-1575 m, 26.5 mm, holotype MNHN.

9. *Trophon bahamondei* McLean & Andrade V, 1982, Chile, SW of Coquimbo, 370 m, 38 mm, coll. R. Houart.

10-15. *Boreotrophon avalonensis* Dall, 1902: 10-11. California, Santa Barbara Channel, off Avalon, 80 fms (146 m), figured holotype, 16.6 mm, USNM 109109; 12-13. California, off Pt. Loma, 120-131 m, holotype of *Boreotrophon calliceratus* (Dall, 1919), 14.9 mm, USNM 209914; 14-15. Southern California, Redondo, 100 m, 13.2 mm, coll. R. Houart.



Description. Shell medium sized for the genus, up to 16.9 mm in length (holotype), slender, lanceolate, lightly built. Spire high with weakly convex, narrow, lamellate teleoconch whorls. Suture impressed.

Axial sculpture of teleoconch whorls consisting of moderately high, narrow, rounded ribs, each topped with low, narrow, adaperturally sloping lamella. Lamellae only subsisting on last teleoconch whorl, eroded on other whorls. Exact number of teleoconch whorls unknown (early whorls eroded). Last whorl with 10-12 straight, vertical axial ribs, penultimate with 11 vertical of weakly oblique ribs, antepenultimate with 10 or 11 oblique ribs. Spiral sculpture absent.

Aperture narrow, ovate, Columellar lip narrow, smooth, rim completely adherent. Outer lip smooth. Siphonal canal long, broad, weakly dorsally recurved, broadly open.

Chalky white, aperture glossy white.

Operculum light brown, broadly ovate with nucleus in lower left.

Remarks. *Trophon vangoethemi* n.sp. resembles *Boreotrophon avalonensis* Dall, 1902 (Figs. 10-15, 33, 35), a species described from South California, distant from more than 8000 kms from Concepción, the type locality of *T. vangoethemi* n.sp. *T. vangoethemi* n.sp. differs from *B. avalonensis* in having a weakly narrower shell with a comparatively longer siphonal canal, a broader and more conspicuous shoulder cord (P1), broader and lower axial lamellae with more narrowly open triangular projections at shoulder (Figs 32 and 34), and more oblique axial sculpture on early teleoconch whorls. *B. calliceratus* (Dall, 1919) (Figs 12-13) is a synonym of *B. avalonensis*. See also McLean (1996) for further illustrations of *B. avalonensis*.

Etymology. Named after Jackie L. Van Goethem, Institut royal des Sciences naturelles, Belgium, in recognition for his collaboration in many ways.

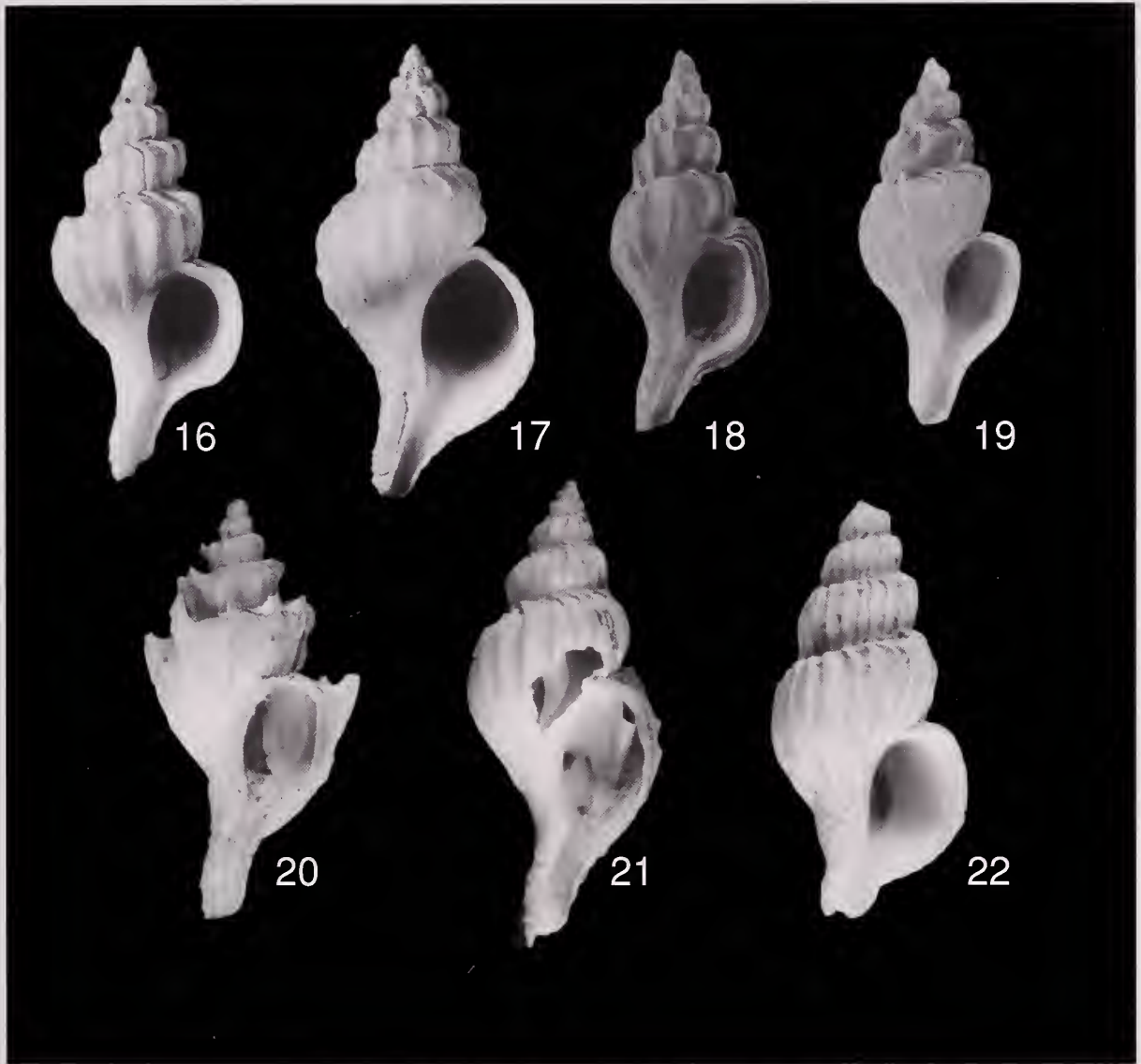
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Figures 16-22

16-17. *Boreotrophon clathratus* (Linnaeus, 1758): 16. Iceland, Grimsey, 23.5 mm, coll. R. Houart; 17. Norway, Balsfjord, 36.1 mm, coll. R. Houart.

18-19. *Trophon barnardi* Houart, 1987: 18. South Africa, off Cape St Blaize, 10.2 mm, holotype NM A4403; 19. South Africa, Transkei, off Qolora River, 32°46.2' S, 28°37.5' E, 440-446m, 7 mm, paratype NM C4060.

20. *Trophon coulmanensis* E.A. Smith, 1907, Ross Sea, off Coulman Island, 183 m, holotype BM(NH) 1905.9.25.52.

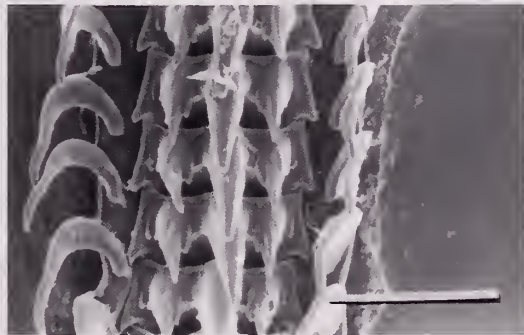
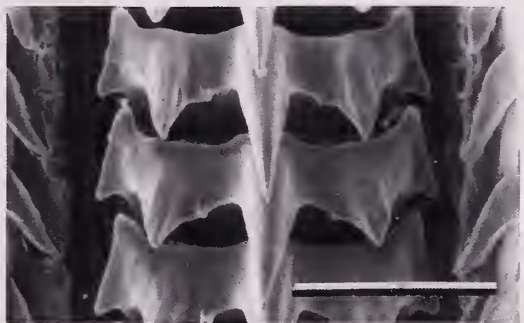
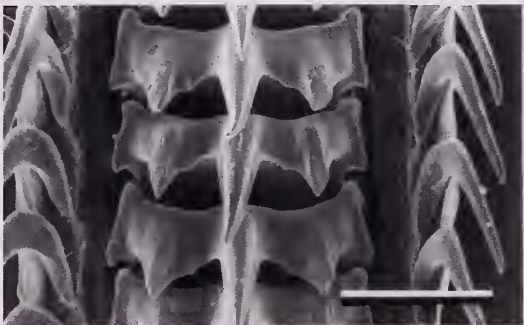
21. *Trophon declinans* Watson, 1882, off Marion Island, 46°48'S, 37°39,30'E, 100 fms? (183 m), 19.1 mm, lectotype BM(NH) 1887.2.9.573.4.

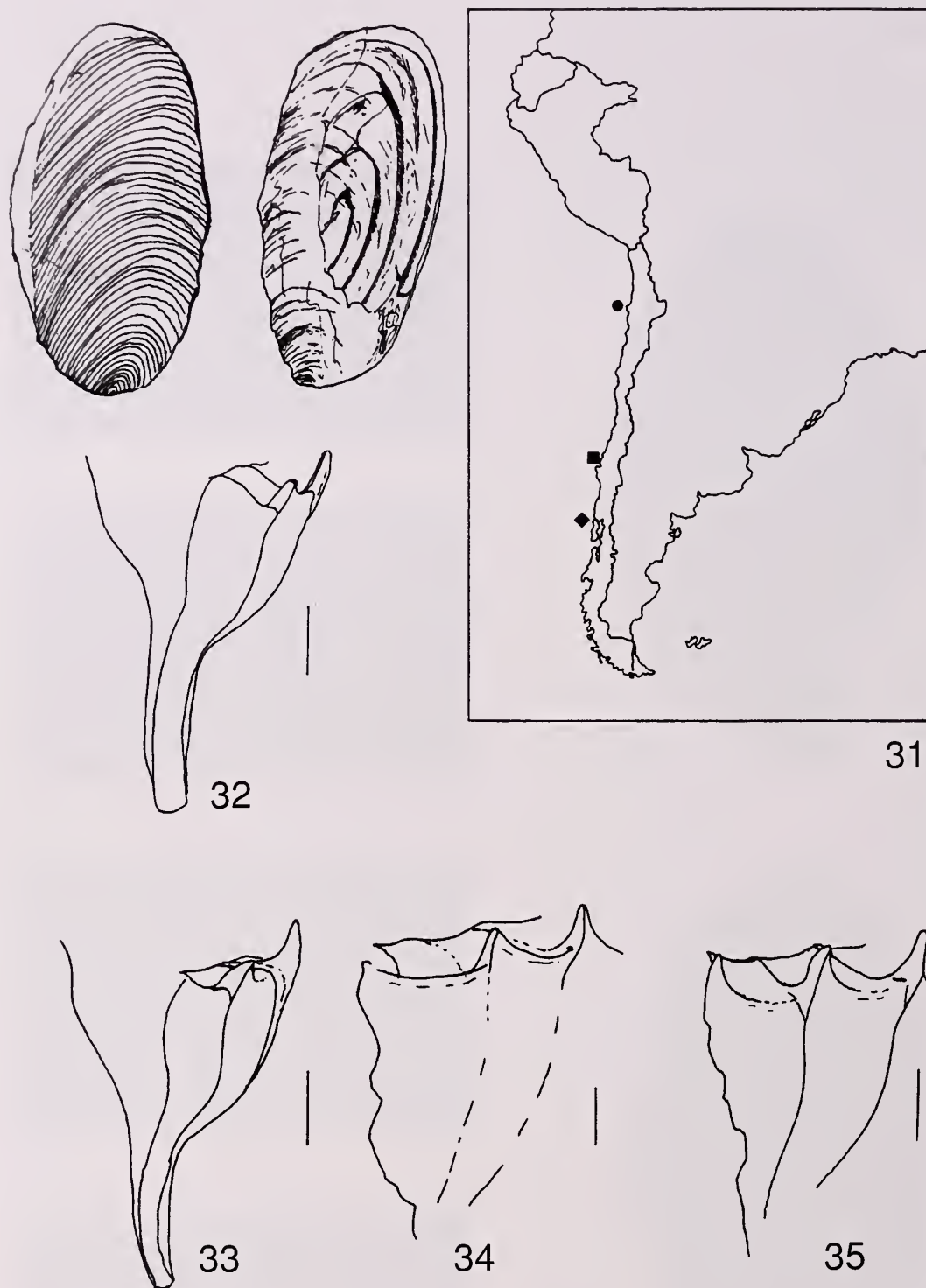
22. *Trophon minutus* Melvill & Standen, 1907, S Orkney Islands, Signy Id, Borge Bay, 2-20 m, 9 mm, NMW-Z-1979.002.72a (illustrated in Oliver & Picken, 1984: Figs. 33a & b).

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Figures 23-28

23. Operculum of *Trophon condei* n.sp., holotype, scale bar: 2 mm.
24. Operculum of *Trophon ceciliae* n.sp., holotype, scale bar: 2 mm.
- 25-26. Radula of *Trophon geversianus* (Pallas, 1774), type species of *Trophon* Montfort, 1810. Patagonia, Argentina. Scale bar: 100 µm.
27. Radula of *Nucella lapillus* (Linnaeus, 1758), type species of *Nucella* Röding, 1798. Brittany, France. Scale bar: 100 µm.
28. Radula of *Boreotrophon clathratus* (Linnaeus, 1767), type species of *Boreotrophon* Fischer, 1884. Gufunes, Iceland. Scale bar: 30 µm.



**Figures 29-35**

29-30. Operculum of *Boreotrophon clathratus* (Linnaeus, 1758).

31. Distribution map.

● *T. ceciliae* n.sp.

■ *T. vangoethemi* n.sp.

◆ *T. condei* n.sp.

32-35. Detail of lamellae and shoulder spines: 32-34. *T. vangoethemi* n.sp.; 33-35. *T. avalonensis* Dall, 1902

Scale bars: 32 & 33: 2 mm; 34 & 35: 1 mm